PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(hunteb01.007)

Applicant:	Hunter, et al.	**Confirmation No.:**	5130
Application No:	10/018,696	**Group Art Unit:**	3693
Filed:	12/13/2001	**Examiner:**	Khattar, Rajesh

Title: *Resource allocation techniques*

Commissioner for Patents
Alexandria, VA 22313-1450

Response to a final Office action under 37 C.F.R. 1.116

Summary of the prosecution

This application is the U.S. National Stage of PCT/US01/00636, filed 9 January 2001 and claiming priority from U.S. Provisional Patent Application 60/175,261, filed 10 January 2000. Examiner made a telephonic restriction requirement in the application in which she found three groups of claims:

Group A	Claims 1-10
Group B	Claims 11-18
Group C	Claims 19-24

Applicants elected the claims of Group C without traverse.

In a first Office action mailed 4/2/2007, Examiner rejected claims 19-24 under 35 U.S.C. 101 as not being directed to patentable subject matter and under 35 U.S.C. 103 as obvious over the combination of U.S. patent 6,085,216, Huberman, et al., *Method and system for efficiently allocating resources for solving computationally hard problems*, filed Dec. 31, 1997 and issued July 4, 2000 (hereinafter "Huberman") and Jan A. Van Mieghem, *Multi-resource investment strategies under uncertainty*, dissertation, Graduate School of Business, Stanford University, April, 1995 (hereinafter "Van Mieghem"). Applicants responded by amending their claims to overcome the rejections under 35 U.S.C. 101, traversing the rejections under 35 U.S.C. 103,

amending claim 23 to correct an error, and adding new claims 25 and 26, which remove an unnecessary limitation of claims 19 and 20.

Applicants thereupon received a final Office action mailed 9/6/2007 in which Examiner withdrew the rejection under 35 U.S.C 101 and presented new rejections under 35 U.S.C. 103(a). In these rejections, Examiner combined the publication, Kaplan, Paul, "Asset allocation models using the Markowitz approach", having a date of 1998 (hereinafter "Kaplan) with U.S. Patent 6,321,212, Lange, *Financial products having a demand-based, adjustable return and trading exchange therefor*, having a filing date of November 24, 1999 (hereinafter "Lange") to reject claims 19, 20, and 25-26 and combining Kaplan, Lange, and Ross, Westerfield, and Jaffe, *Corporate Finance*, fourth edition, 1996, Chapter 10, "Return and Risk" (hereinafter "Corporate Finance").. Applicants are traversing the rejection.

Traversal

Traversal of the rejections of claims 19, 20, and 25-26

This rejection is based on the combination of Kaplan and Lange.

Claim 19 as amended in the response of 6/27/07 is typical for independent claims 19 and 25:

> **19.** (currently amended) A method of allocating investment funds among a set of at least two asset classes to optimize valuation of the asset classes over a period of time, data concerning the asset classes being stored in storage accessible to a processor and the method comprising the steps performed in the processor of:
>
> employing a linear optimization program to optimize the valuation and in the linear optimization program, using a real option function to determine valuation for each asset class over the period of time for a particular allocation of the funds to the asset class, the valuations for the particular allocations of the funds to the asset class being stored in the storage for access by the processor.

As set forth in MPEP 2142, in order to reject a claim under 35 U.S.C. 103, Examiner must make a *prima facie* case of obviousness. A necessary element of the *prima facie* case is a demonstration that the combined references disclose all of the limitations of the claim under rejection.

In his rejection, Examiner cites Kaplan for the step of "employing a linear optimization program to optimize the valuation" but admits that Kaplan does not disclose the step of "using a real option function to determine valuation for each asset class over a period of time for a particular allocation of the funds to the asset class". Examiner finds a disclosure of such a use of the real option function in Lange at col. 57, line 54-col. 58, line 25.

Lange is a patent with 112 columns of Specification. The fact that the only mention of real options in all 112 columns is at the location cited above immediately casts some doubt on Lange's usefulness as a source of information about real option functions. The doubt becomes certainty when one looks closely at the cited location. Col. 57, line 54-col. 58, line 8 of Lange set forth the following:

> Investment and capital budgeting choices faced by firms typically involve inherent economic risk (e.g., future demand for semiconductors), large capital investments (e.g., semiconductor fabrication capacity) and timing (e.g., a decision to invest in a plant now, or defer for some period of time). Many economists who study such decisions under uncertainty have recognized that such choices involve what they term "real options." This characterization indicates that the choice to invest now or to defer an investment in goods or services or a plant, for example, in the face of changing uncertainty and information, frequently entails risks similar to those encountered by traders who have invested in options which provide the opportunity to buy or sell an underlying asset in the capital markets. Many economists and investors recognize the importance of real options in capital budgeting decisions and of setting up markets to better manage their uncertainty and value. Natural resource and extractive industries, such as petroleum exploration and production, as well as industries requiring large capital investments it such as technology manufacturing, are prime examples of industries where real options analysis is increasingly used and valued.

In the cited location, Lange is using the term "real option" in the same manner as it was used in the van Mieghem reference cited by Examiner in the Office action of 04/02/2007. The discussion of real options as that term is used in van Mieghem from Applicants' response of 27 June 2007 follows:

"Real options" in Van Mieghem

van Mieghem's *Abstract*, cited in the Office action 0f 04/02/2007, sets forth the following:

> I develop a theory of investment in multiple real assets or "resources". This theory focuses on the interaction among uncertainty, irreversibility, investment timing, and multidimensionality within the investment portfolio. Using a "real options" approach, this work provides qualitative insights on the character of optimal investment strategies and special "hedging opportunities that arise in multi-dimensional models of real investments.

On close examination of the use of "real options" in van Mieghem, it becomes clear that the manner in which van Mieghem uses the term "real options" is fundamentally different from the way the term is used in Applicants' Specification and claims. Real options are explained at page 2, lines 11-21 of Applicants' Specification as follows:

> The advantage of the real option model is that it takes better account of uncertainty ... because things are uncertain, the risk and return for an action to be taken at a future time is constantly changing. This fact in turn gives value to the right to take or refrain from taking the action at a future time. Such rights are termed *options*. Options have long been bought and sold in the financial markets. The reason options have value is that they reduce risk: the closer one comes to the future time, the more is known about the action's potential risks and returns. Thus, in the real option model, the potential value of a resource allocation is not simply what the allocation itself brings, but additionally, the value of being able to undertake future courses of action based on the present resource allocation.

A technique for calculating the value of a real option using the Black-Scholes formula is presented at page 7, line 26-page 8, line 12. Page 8, lines 13-16 further show how an optimization program can be used to maximize the real option value of a portfolio.

As is abundantly clear from the foregoing, the real options of Applicants' Specification have prices, i.e., they have *quantitative values*. Indeed, it is *because* real options have quantitative values that a function which computes real option values can be used as the objective function in an optimization program.

That the "real options" of van Mieghem are different from those of the financial world is initially clear from van Mieghem's use of quotation marks to set off the term and from his statement that his dissertation "provides *qualitative* insights on the character of optimal investment strategies" (emphasis added). If van Mieghem's "real options" were like those of the financial world, he would be able to provide *quantitative* insights as well.

What van Mieghem means by real options becomes clearer at the bottom of page 1 and the top of page 2 of his dissertation:

> I develop a theory of multi-resource investment under uncertainty. The focus is on investments in *real* assets. To stress the distinction, but at the same time the analogy, with investment in financial assets, the 'opportunities to acquire real assets are sometimes called *real options*' (cite). This dissertation provides a 'real options' approach to multi-dimensional investment.

To begin with, van Mieghem uses the term "real assets" to distinguish the assets he is concerned with from "financial assets". As set forth further on in pages 2 and 3, real assets are investments in plant and equipment and people. van Mieghem's "real options" approach is aimed at analyzing these kinds of investments using a methodology which is *analogous to* the real options methodology used to analyze financial investments. A fundamental distinction between his "real options" methodology and the real options methodology used in finance is, however, that van Mieghem's results remain *qualitative*, while the results of the financial methodology are *quantitative*. Because van Mieghem's results are *qualitative*, finally, van Mieghem cannot and does not disclose a real option function that can be plugged into an "optimization program" as required by Applicants' claim 19.

Lange and claims 19 and 25

Examiner will immediately see from the citation from Lange cited above that Lange is using the term "real options" in the same way as van Mieghem. As set forth in the citation, Lange's "Groups of DBAR contingent claims ... can be used by firms ... to better analyze capital budgeting decisions, including those involving real options" (col. 58, lines 9-13). The DBAR contingent claims can also be used

> to better hedge their capital budgeting decisions and provide information as to the market's expectation of future prices over the entire distribution of possible price outcomes. This information about the market's expectation of future prices could then also be used in the real options context in order to better evaluate capital budgeting decisions. (col. 58, lines 17-23)

None of this has anything whatever to do with the claimed

> in the linear optimization program, using a real option function to determine valuation for each asset class over the period of time for a particular allocation of the funds to the asset class,

Because Lange does not disclose the above limitation, the combination of Kaplan and Lange does not disclose all of the limitations of claim 19; as Examiner will immediately appreciate, the combination of Kaplan and Lange also does not disclose all of the limitations of independent claim 25; consequently, Examiner has not made the required *prima facie* case of obviousness with regard to either of those claims and those claims and all of the claims dependent from those claims are patentable over the references.

Dependent claims 20-22 and 26

The dependent claims are of course all patentable because they are dependent from patentable claims. However the dependent claims further have additional limitations that are not disclosed in Kaplan, Lange, or Corporate Finance and are consequently patentable in their own rights over Kaplan and Lange or Kaplan and Lange combined with Corporate Finance.

Claims 20 and 26

An added limitation in claims 20 and 26 is "employing a constraint in the linear optimization program that specifies a reliability of a return for the portfolio for a particular allocation of funds to the asset classes". The only disclosure concerning constraints in the references is at page 6, lines 20-22 of Lange, where the constraint is the limit on how much the US investor can invest in non-US assets. This of course has nothing to do with the claim's "a constraint ... that specifies a reliability of a return". Claims 20 and 26 are thus patentable in their own rights over the references.

Claims 21-24

These claims are dependent from claim 20, and are consequently patentable not only because of their dependence from claim 19 but also because of their dependence from claim 20.

Conclusion

Applicants have further demonstrated that the references do not disclose all of the limitations of claims 19-26 and that Examiner's rejection of those claims under 35 US 103 for obviousness is without basis. Applicants have consequently been fully responsive to Examiner's Office action of 9/6/2007 and respectfully request that Examiner either withdraw the finality of the rejection and continue with his examination or allow the claims. No fees are believed to be required for this response; should any be, please charge them to deposit account number 501315.

Respectfully submitted,

/Gordon E. Nelson/
Attorney of record,
Gordon E. Nelson
57 Central St., P.O. Box 782
Rowley, MA, 01969,
Registration number 30,093
Voice: (978) 948-7632
Fax: (866)-723-0359
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